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Effect of nitrogen fertilizer on different attributes of gladiolus (*Gladiolus grandiflorous* L.) cv. American Beauty

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Abstract**—** *An experiment was conducted to evaluate the effect of nitrogen fertilizer on growth, flowering and vase life of gladiolus (Gladiolus grandiflorous L.) cv. American Beauty at the farm of the Department of Horticulture, C.C.R (P.G.) College, Muzaffarnagar (Uttar Pradesh). The treatments comprised of four levels of nitrogen (0, 40, 60, 80 kg/acre) in a randomized complete block design with factorial concept and replicated four times. The results revealed that minimum days taken for spike initiation (86.89 days), days taken for first flowering (99.37 days) were observed under control treatment N_0 whereas, maximum plant height (49.21cm), spike length (127.17 cm), rachis length (61.31 cm), number of florets per spike (18.00) and vase life (11.73 days) was found with N_2 (60 kg/acre Nitrogen).*

The result shows that using 60 kg/acre nitrogen can improve the growth and yield of gladiolus cv. American Beauty like vegetative, flowering and vase life attributes. Hence, this optimum nitrogen level can be recommended for the commercial cultivation of gladiolus.

Keywords**— Nitrogen, spike, rachis, florets, vase life, gladiolus.**

I. INTRODUCTION

Gladiolus (*Gladiolus grandiflorus* L.), Iridaceae family, is also known as "Queen of bulbous flowers", which is valued for its beautiful flower spikes. Generally called "sword lily" due to foliage shape belong to family and originated from South Africa, is a prominent bulbous cut flower plant (Sharma *et al.,* 2013). Its cultivation is getting popular for its beautiful flowering spikes due to more vase life as a cut-flower. Its magnificent inflorescence with variety of colors and number of pretty florets has made it attractive for diversified use in the garden. It is an important cut-flower in both domestic and international market. Nutrient status of the plants can be a pointer to the response of plant to the fertilization and internal content of the nutrients determine the fertilizer requirements. Nitrogen applied as fertilizer is the main source used to meet the requirements of plant growth (Polara *et al*., 2014). The nutrients such as nitrogen play a major role in the growth and development of plants. Nitrogen is an essential macro element that improves the chemical and biological properties of soil and thereby stimulates the production of higher yield in plants. It should be emphasized that to increase plant quality and productivity nutrients need to be available from the soil during a plant's growth period. Nitrogen fertilizer is one of the important factors in canopy formation that its deficiency leads to a decrease of photosynthesis. This objective can be achieved through balanced and judicious application of plant nutrients.

II. MATERIALS AND METHODS

An experiment was conducted to determine the "Effect of nitrogen fertilizer on different attributes of gladiolus (*Gladiolus grandiflorous* L.) cv. American Beauty" at the farm of the Department of Horticulture, C.C.R (P.G.) College, Muzaffarnagar (Uttar Pradesh) for two years and the data were pooled. The experiment was laid out in randomized complete block design with four replications and different levels of Nitrogen fertilizer.

The half-dose of Nitrogen along with full dose of phosphorous and potassium was given in the form of basal dose which was thoroughly mixed in experimental plots before planting. Remaining half-dose of nitrogen applied at 30 days after transplanting having four levels of nitrogen (0, 40, 60, 80 kg/acre) and the size of the plots was 4 m^2 (2m x 2m). Freshly harvested spikes were kept in vase containing 2% sucrose solution at room temperature to calculate the longevity of spikes.

The variety adopted was American beauty, which shows good performance in Muzzafarnagar (U.P.) conditions.

Soil samples were taken and were analyzed and pH of soil was done according to Piper (1966) and available nitrogen in soil. (Subhiah and Asija, 1956)

Chemical characteristics of experimental soil (Horticulture farm, Department of Horticulture, C.C.R (P.G.) College, Muzaffarnagar)

Chemical analysis:

Percentage	Chemical composition of soil
0.03	Nitrogen
0.10	Phosphorous
1.05	Potassium
0.49	Organic carbon

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The crop was raised by using standard cultural practices. A basal dose of well rotten FYM was uniformly mixed in the soil. Corms were treated with 0.2% Bavistin solution for half an hour and were dried under shade for few minutes. Corms were then planted 5 cm deep and 25 cm apart, with row-to-row distance of 40 cm.

The observations were recorded for traits like plant height, days taken for spike initiation, days taken for first flowering, spike length, rachis length, number of florets per spike and vase life and were statistically analyzed as per the procedure outlined by applying the technique of analysis of variance (ANOVA) as suggested by Panse and Sukhatme (1967). All the statistical analysis was carried out by using OPSTAT statistical software.

III. RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under the following heads:

1. **Plant height**

   It is evident from the table that plant height was influenced by different levels of nitrogen fertigation. However, taller plants (49.21cm) were observed in 60 kg/acre nitrogen (N_2) which was significantly at par with N_3 whereas, shortest plants were observed in N_0 (43.75cm) treatment. This might be due to the reason as the nitrogen flow into the plants cause the better growth and stimulate the auxillary buds resulting in more flowers stalk height. Similar results were reported by Singh *et al.* (2000).

2. **Days taken for spike initiation**

   Perusal of data presented in the table shows that spike emergence was early in the plants with N_0 treatment (86.89days) and was significantly superior to all the other treatments whereas, maximum days (95.59days) were taken for spike emergence under N_3. Chanda *et al.* (2000) reported that increase the doses of nitrogen resulted delayed the emergence of spike and nitrogen promotes vegetative growth in gladiolus.

3. **Days taken for first flowering**

   Comparison of different fertigation levels shows significant results in comparison to days taken for first flowering. Early flowering (99.37days) was shown in N_0 treatment whereas, maximum duration (104.84days) were taken under 80 kg/acre nitrogen (N_3). Increasing levels of nitrogen were marked to delay the heading significantly and thereby prolonged the duration of flowering.

Table: Effect of different levels of nitrogen on attributes of gladiolus cv. American Beauty

Vase Life (days)	Number of florets per spike	Rachis Length (cm)	Spike Length (cm)	First Flowering (days)	Spike Initiation (days)	Plant Height (cm)	Treatments Nitrogen kg/acre
9.09	14.27	46.43	100.81	99.37	86.89	43.75	**N_0**
10.59	16.39	52.95	118.46	101.99	92.17	46.28	**N_1**
11.73	18.00	61.31	127.17	103.49	93.75	49.21	**N_2**
11.61	17.53	56.55	124.03	104.84	95.59	47.44	**N_3**
0.38	0.54	0.51	0.53	1.87	1.86	2.19	**CD at 0.05%**

Where N_0 - (0 kg/acre), N_1- (40 kg/acre), N_2- (60 kg/acre), N_3- (80 kg/acre)

4. **Spike length**

   Data presented in the table indicates that variation in spike length among different levels of nitrogen fertigation was found to be highest (127.17cm) under 60 kg/acre nitrogen (N_2) whereas, lowest spike length (100.81cm) was observed under control (N_0). It is well established that the nitrogen is one of the major essential elements, which regulates the cell and tissue functions of the plant being essential part of the nucleic acid, mitochondria and cytoplasmic contents of the cells. These results indicates that wherever nitrogen, whether or not in combination with P and K or both, was added into the soil has showed increase in the spike length (S.J. Butt, 2005).

5. **Rachis length**

   Significant variations were observed w.r.t rachis length of the plants. Highest length (61.31cm) was observed in plants having N_2 treatment whereas, lowest rachis length (46.43cm) was observed in the plants under control (N_0). This might be due to greater uptake of nutrients into the plants system which involved in cell division, cell elongation as well as protein synthesis which ultimately enhanced the rachis length. Similar results were found by Kumar *et al.* (2003) in China aster and Lehri *et al.* (2011) in Gladiolus.

6. **Number of florets per spike**
   Maximum number of florets per spike (18) was found in the plants having 60 kg/acre nitrogen (N_2) treatment which was at par with N_3 treatment whereas, minimum number of florets (14.27) per spike was observed under control (N_0). Similar results were founded by Kumar *et al.* (2003) in China aster, Lehri *et al.* (2011), Singh and Bijimol (2003) in Gladiolus.
7. **Vase life**
   Maximum longevity of spike (11.73days) was observed in the plants grown under N_2 treatment which was at par with N_3 treatment whereas, minimum vase life of spikes (9.09days) was observed under N_0 treatment. Maximum vase life might be due to the accumulation and delay in degeneration of carbohydrates and proteins in the plants.

IV. CONCLUSION

Different levels of N-fertigation affect the different attributes of gladiolus cv. American beauty. Cultivar under the study showed better performance at comparatively medium fertigation level i.e 60 kg/acre nitrogen (N_2) than, lowest and highest levels. It may also concluded that excessive use of nitrogen beyond a certain limit is not only wasteful but also results in adverse effects on both plant and soil structure.

Hence, medium fertigation level i.e. 60 kg/acre nitrogen is recommended for general cultivation of gladiolus cv. American Beauty for this region.

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